

WHAT IS CLAIMED IS:

1. A process of preparing a hydro-oxidation catalyst composition comprising gold on a titanium-containing support, for an oxidation process with oxygen in the presence of hydrogen,  
5 the preparation process comprising impregnating a gold compound and impregnating a reducing agent onto a catalyst support, wherein the reducing agent comprises titanium, or the catalyst support comprises titanium, or both the reducing agent and the catalyst support comprise titanium, under conditions sufficient to prepare the hydro-oxidation catalyst composition.
- 10 2. The process of Claim 1 wherein the gold compound is selected from the group consisting of chlorauric acid, sodium chloraurate, potassium chloraurate, gold cyanide, potassium gold cyanide, diethylamine auric acid trichloride, gold acetate, alkyl gold halides, and alkali aurates.
- 15 3. The process of Claim 1 wherein the process is conducted at a gold loading greater than about 10 parts per million by weight, based on the total weight of the gold and support.
4. The process of Claim 1 wherein the reducing agent is an organic compound that does not contain titanium.
- 20 5. The process of Claim 4 wherein the reducing agent is selected from the group consisting of sugars, carboxylic acids and salts thereof, alcohols and alkoxide salts thereof, alkanolamines, alkylamines, and mixtures thereof.
- 25 6. The process of Claim 4 wherein the reducing agent is selected from the group consisting of C<sub>6-20</sub> sugars, C<sub>2-20</sub> carboxylic acids, C<sub>1-15</sub> aliphatic alcohols, C<sub>1-15</sub> alkylamines, the alkali and alkaline earth salts of the aforementioned sugars, carboxylic acids, and alcohols, and mixtures of any of the aforementioned compounds.
- 30 7. The process of Claim 4 wherein the reducing agent is selected from the group consisting of methanol, ethanol, isopropanol, ethanolamine, acetic acid, lactic acid, citric acid, maleic acid, cinnamic acid, sodium acetate, sodium lactate, sodium citrate, sodium cinnamate, sodium maleate, and mixtures thereof.
- 35 8. The process of Claim 4 wherein the process is conducted at a molar ratio of reducing agent to gold of greater than 0.5:1.

9. The process of Claim 4 wherein the organic reducing agent also functions as a solvent for the impregnation.

5           10. The process of Claim 1 wherein the reducing agent contains titanium.

11. The process of Claim 10 wherein the reducing agent is an organotitanium compound characterized by the presence of a titanium-carbon  $\sigma$  or  $\pi$  bond.

10           12. The process of Claim 11 wherein the organotitanium compound is selected from the group consisting of alkyltitanium compounds and cyclopentadienyl titanium compound.

13. The process of Claim 10 wherein the reducing agent is a titanium coordination compound.

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14. The process of Claim 13 wherein the titanium coordination compound is selected from the group consisting of titanium alkoxides and titanium carboxylates.

15. The process of Claim 14 wherein the titanium coordination compound is titanyl acetylacetonate.

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16. The process of Claim 10 wherein the gold compound is deposited onto the support prior to deposition of the titanium-containing reducing agent.

25           17. The process of Claim 10 wherein the process is conducted at a titanium loading of the titanium-containing reducing agent greater than 0.02 weight percent and less than 20 weight percent, based on the weight of the support.

18. The process of Claim 1 wherein the catalyst support is selected from the group consisting of titanium dioxide, titanosilicates, titanium dispersed on silica, promoter metal titanates, titanium dispersed on promoter metal silicates, and mixtures thereof.

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19. The process of Claim 10 wherein the reducing agent contains titanium and the support is selected from the group consisting of silicas, aluminas, aluminosilicates, zirconia, magnesia, carbon, titania, and mixtures thereof.

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20. The process of Claim 1 wherein the process is conducted at a titanium loading on the support of greater than 0.02 weight percent and less than 20 weight percent, based on the weight of the support.

5           21. The process of Claim 1 wherein both the reducing agent and the support contain titanium.

22. The process of Claim 1 wherein at least one promoter metal compound is impregnated onto the support.

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23. The process of Claim 22 wherein the promoter metal is selected from the group consisting of silver, Group 1, Group 2, the lanthanide rare earth metals, the actinide metals of the Periodic Table, and mixtures thereof.

15           24. The process of Claim 22 wherein the total concentration of promoter metal or metals ranges from greater than about 0.01 to less than about 20 weight percent, based on the total weight of the catalyst.

25. The process of Claim 1 wherein the solvent for the impregnation is selected from the group consisting of water, organic solvents, and mixtures thereof.

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26. The process of Claim 1 wherein after impregnation, the support is washed.

27. The process of Claim 26 wherein after washing, the support is treated with a solution containing at least one promoter metal.

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28. The process of Claim 1 wherein the impregnation is conducted to the point of incipient wetness or a point of lesser wetness.

29. The process of Claim 1 wherein the impregnation is conducted at a temperature between about 21°C and about 100°C.

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30. The process of Claim 1 wherein after impregnation and any additional steps of washing and treating with a promoter metal, the catalyst is heated.

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31. The process of Claim 30 wherein the heating is conducted at a temperature greater than about 250°C and less than about 800°C.

5 32. The process of Claim 30 wherein the catalyst is heated in oxygen or an oxygen-containing gas, or heated in an inert atmosphere, or heated in a reducing atmosphere.

10 33. A process of preparing a hydro-oxidation catalyst composition comprising gold on a titanium-containing support, for oxidizing an olefin with oxygen in the presence of hydrogen to form an olefin oxide, the preparation process comprising impregnating a gold compound and impregnating a reducing agent onto a catalyst support, wherein the reducing agent comprises titanium, or the catalyst support comprises titanium, or both the reducing agent and the catalyst support comprise titanium, under conditions sufficient to prepare the hydro-oxidation catalyst composition.

15 34. The process of Claim 33 wherein the olefin is propylene and the olefin oxide is propylene oxide.